

KING-GAGE® Marine Systems

Tank Level and Draft Indicating Systems for the Marine and Offshore Industries

LiquiSeal™ Purge Control

- Level Sensor for Cargo and Service Tanks or Ship's Draft
- Externally Mounted at the Tank or Remotely
- Pneumatic or Electronic (4-20 mA) Output

The downpipe level sensor is a highly refined version of a bubbler system using a precision air flow controller. A downpipe is an extremely simple yet effective method of sensing the hydrostatic pressure due to liquid depth. It can be used for tank gauging or ship's draft measurement.

LiquiSeal Purge Control is a fully integrated air purge regulator and pressure transmitter. It can be mounted directly adjacent to the tank or remotely up to 50 feet away. 3/8" air line tubing connects the LiquiSeal unit to the pipe extending downward in the tank. A supply of compressed air is required for system operation.

The rugged brass construction is especially suited to the rigors of marine service. Beneath a durable gloss epoxy finish, the machined brass body and housing resists corrosion while affording maximum protection. For explosion hazard areas, an all-pneumatic version of the LiquiSeal can be used without the need for intrinsic safety provisions.

Pneumatic or Electronic Output

These pressure-based level transmitter provides output proportional to depth. 735 LiquiSeal generates a pneumatic 1:1 pressure signal that can be transmitted to a suitable indicator or pressure transducer. 738 D/P LiquiSeal provides a direct 4-20 mA_{dc} electronic output compatible with most receivers or analog I/O devices.



**Model 738
D/P LiquiSeal
Control**

Principles of Operation

Purging a downpipe with compressed air creates a force balance, resulting in pneumatic pressure equal to the hydrostatic pressure due to liquid depth in the tank. The LiquiSeal Purge Control works as a constant flow regulator, providing a continuous flow of air (1 cfh*) into the downpipe. Pressure is created as liquid is purged from the downpipe.

This pneumatic pressure is the basis for the tank level measurement because it is equal to the hydrostatic (liquid) pressure which is directly proportional to liquid depth. For any increase or decrease of depth, there will also be a corresponding change in the pneumatic pressure.

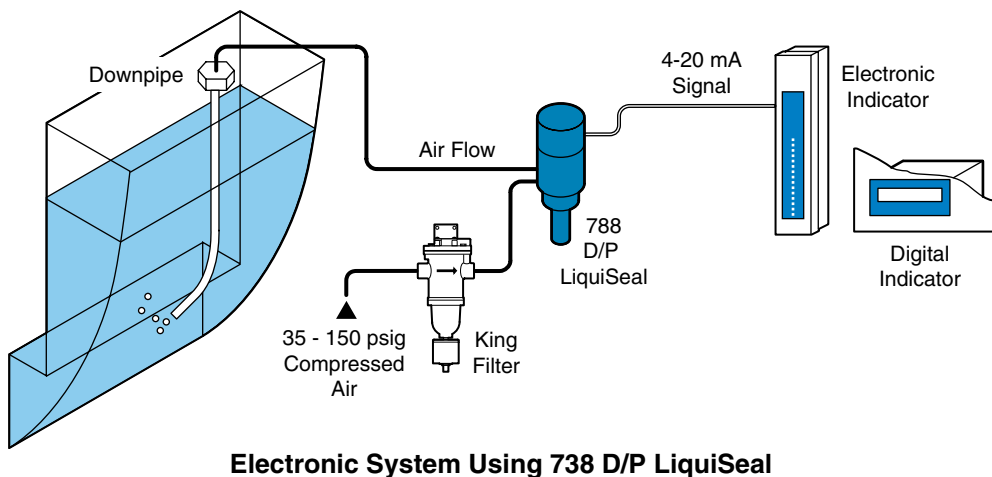
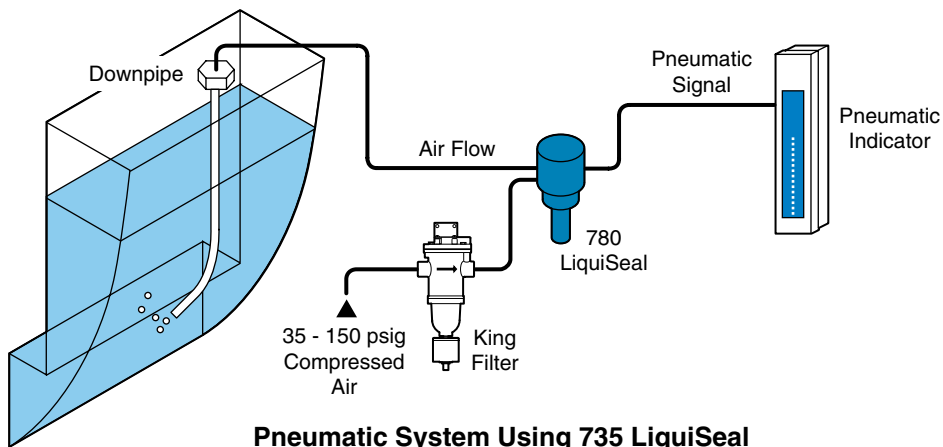
When equilibrium exists (i.e., air pressure = liquid pressure), the continuous flow of air escapes through the open end of the downpipe. This air bubbles up through the liquid hence the reason why this type of level sensing is often termed a "bubbler".

Gauging System

A complete tank gauging system can be configured using pneumatic components or can include electronic transmitters and indicators. Pneumatic sensors and indicators are inherently safe and explosion proof since there are no electrical components involved. A pneumatic system transmits a pressure signal through small bore tubing (typically 1/4" OD) to the pneumatic indicator. The location of the indicator may be up to several hundred feet from the LiquiSeal control.

An electronic system using the D/P LiquiSeal generates a 4-20 mA signal to the indicator. This electronic signal can be transmitted over several thousand feet using twisted pair (2-wire) cable. The indicator can be either an analog column display or digital readout, depending upon preference.

Since the primary element of either system is merely an open-ended pipe, the variety of material selections assures compatibility with tank contents. It may also be readily replaced by the user from any conveniently available source.



Tank Level and Draft Applications

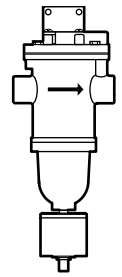
The LiquiSeal Purge Control can be used to sense tank levels or measure ship's draft. The output signal (pneumatic or electronic 4-20 mAdc) can be transmitted to KING-GAGE indicators in the engine room, control center or ship's bridge.

Applications Include:

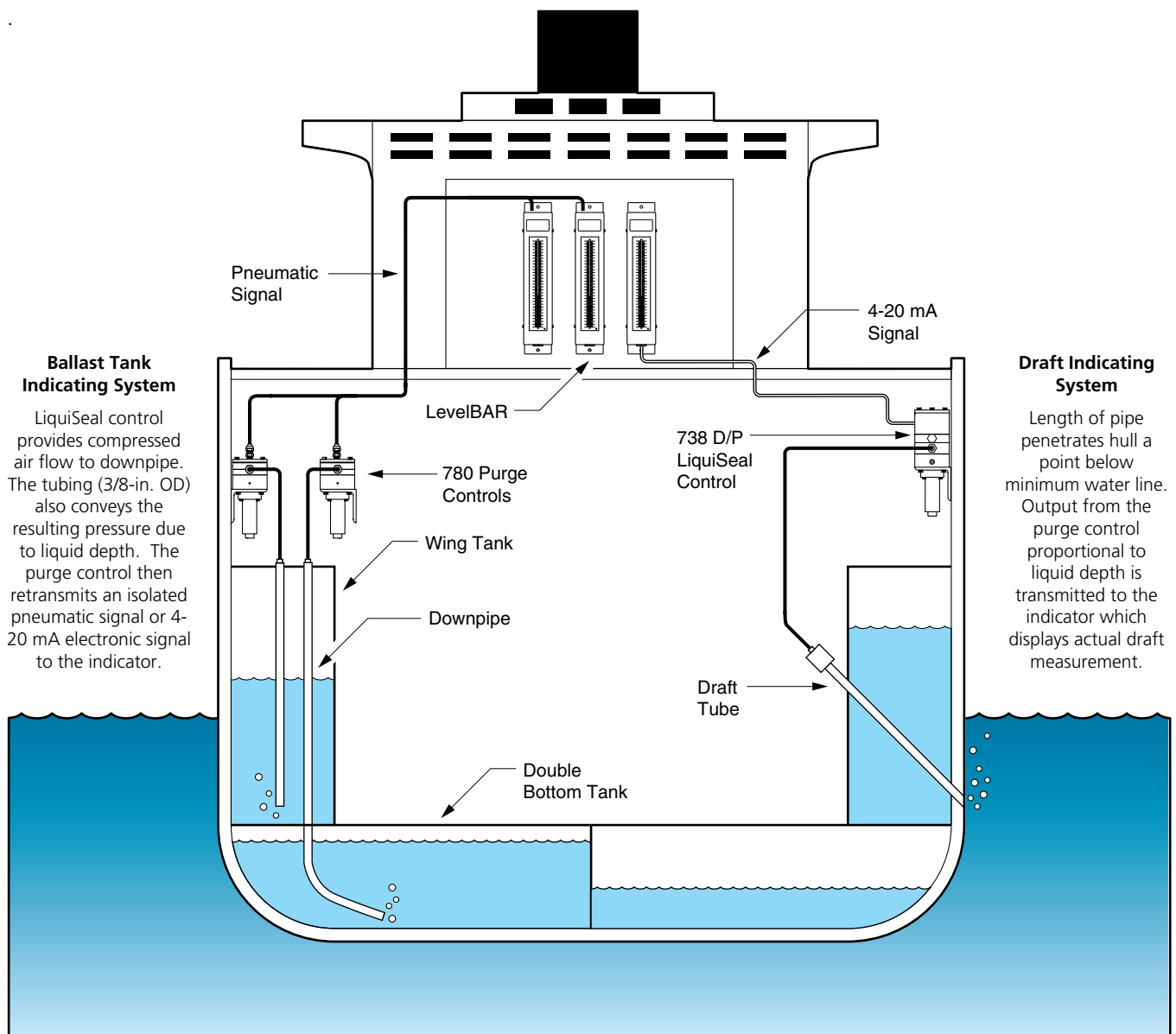
- Ballast water tanks
- Fuel oil tanks
- Day tanks
- Bunker oil tanks
- Liquid cargo tanks

Compressed Air Requirements

All pneumatic instrumentation requires extremely clean, dry and oil-free compressed air. It must be noted that failure to use adequately filtered compressed air will result in unsatisfactory performance. Use of a compressed air coalescing filter (such as the King Air-Guard or King Air Control Station) upstream in the supply line is expressly recommended.



**Air-Guard
Coalescing
Filter**



Ballast Tank Indicating System

LiquiSeal control provides compressed air flow to downpipe. The tubing (3/8-in. OD) also conveys the resulting pressure due to liquid depth. The purge control then retransmits an isolated pneumatic signal or 4-20 mA electronic signal to the indicator.

Draft Indicating System

Length of pipe penetrates hull a point below minimum water line. Output from the purge control proportional to liquid depth is transmitted to the indicator which displays actual draft measurement.

Model 735/738 Tank Level and Draft Indicating Systems

KING-GAGE® Marine Systems

Specifications

735 LiquiSeal Control

Unit incorporates differential air flow regulator with flow control orifice, backpressure regulator and pneumatic transmitter. Fixed differential set to nominal 10 psid. Transmitter employs titanium diaphragm (.001" thick) as positive seal from the tank connection.

738 D/P LiquiSeal Control

Same as the 735 model but adds an integral differential pressure (D/P) transmitter converting pneumatic pressure into 4-20 mAdc electronic output. Ranges available: 0-5, -10, -30, -50 psid

Flow Rate (Air Purge)

Nominal 1 cfh (cubic feet per hour) at specified differential. Maximum air consumption under 5 cfh.

Accuracy

735 LiquiSeal Control: $\pm .009$ psi
(± 0.25 " water)
738 D/P LiquiSeal Control: $\pm 0.20\%$ FS

Temperature Range

0°F to 120°F (ambient)
Maximum service limit is interpreted as the maximum ambient temperature at the control. Actual process temperature may be considerably higher since control is not necessarily in direct contact to these conditions.

Material

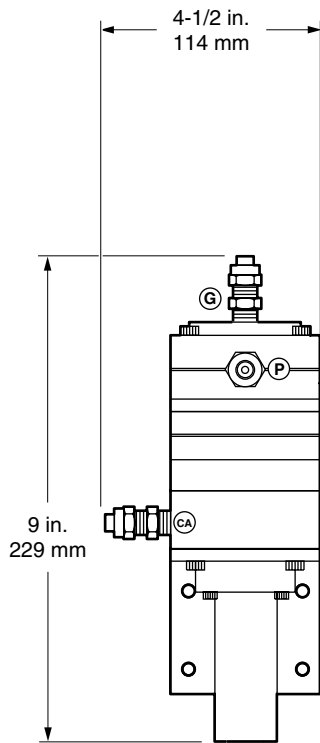
Machined brass body with gloss epoxy finish; integral filter element is aluminum with gloss epoxy finish.

SafeGard Option (735 LiquiSeal Control)

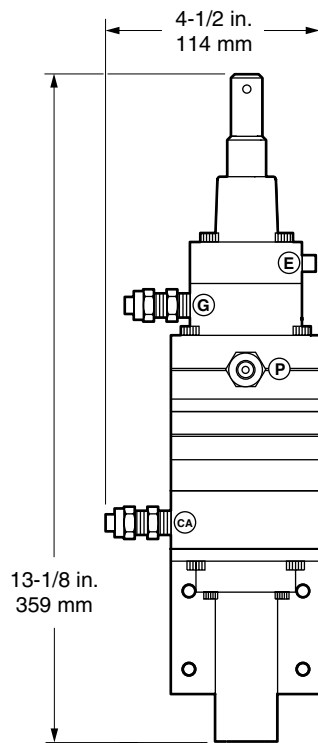
An adjustable pressure-limiting control that permits presetting a maximum value for pressure output from LiquiSeal Control. SafeGard range available as 25" to 650" water or 650" to 1750" water.

Compressed Air Requirements

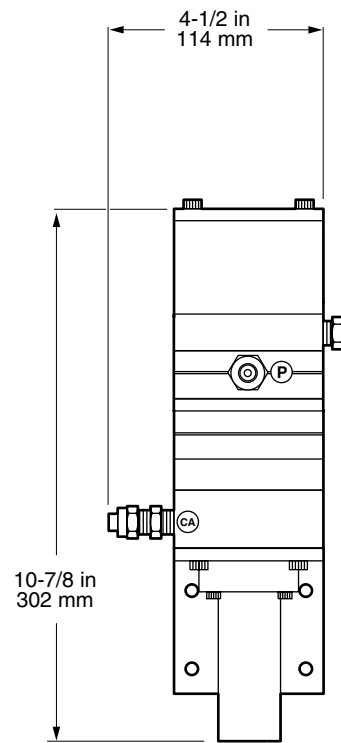
Minimum supply pressure to the LiquiSeal Purge Control should be at least 20 psig greater than anticipated maximum liquid head pressure, but not less than 35 psig. Maximum supply pressure 150 psig.



Model 735 LiquiSeal Control



Model 735 LiquiSeal Control
with SafeGard



Model 738 D/P LiquiSeal Control



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